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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/663,218	09/15/2003	David Abercrombie	02-5695 81564	3751

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Leo J. Peters
LSI Logic Corporation
MS D-106
1551 McCarthy Blvd.
Milpitas, CA 95035

EXAMINER

BHARADWAJ, KALPANA

ART UNIT	PAPER NUMBER
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2109

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/663,218

Applicant(s)

ABERCROMBIE ET AL.

Examiner

Bharadwaj Kalpana

Art Unit

2109

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 11/04/2005 & 09/15/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 8-14 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The claims fail to provide a tangible result, and there must be a practical application, by either

- 1) transforming (physical thing) or
- 2) by having the FINAL RESULT (not the steps) achieve or produce
a useful (specific, substantial, AND credible),
concrete (substantially repeatable/non-unpredictable), AND
tangible (real world/non-abstract) result.

A claim that is so broad that it reads on both statutory and non-statutory subject matter must be amended. If the specification discloses a practical application but the claim is broader than the disclosure such that it does not require the practical application, then the claim must be amended. A claim that recites a computer that solely calculates a mathematical formula is not statutory.

In the present case, claims 8-14 relate to a program product for isolating sources of variance in parametric data. Such, in and of itself, is not believed to be directed to a practical application, which produces a useful, concrete and tangible result. The

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claimed invention fails to specify how such a program product can be used for/in a practical application. While the practical application does not necessarily need to be recited in the claims, the claims in this instance appear to be directed to a program product that is too primitive to convey any practical application to one of ordinary skill in the pertinent art.

Therefore, the examiner contends that the applicant's invention as claimed, relates a computational model or a mathematical manipulation of a function or equation, as such, a process that merely manipulates an abstract idea or performs a purely mathematical algorithm is nonstatutory. Hence, they cannot be afforded patent eligibility.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Wang (USPN 5,859,964, referred to as **Wang**).

As to **claims 1, 8**, Wang teaches a method of isolating sources of variance in parametric data comprising (a medium and a computer program to perform) steps of:

- (a) cleaning a data set of measurements for a plurality of parameters (**Wang**, C 01 L55: collect process parameter data and analyze the data for abnormality or fault);
- (b) generating a principal component analysis basis (**Wang**, C 14 L 13: Principal Component Analysis; C 14 L 40: PCA technique is used; **EN**: basis is a vector generated from PCA) from the cleaned data set;
- (c) estimating an independent component analysis model (**Wang**, C 09 L 06: model is a Principal Component Analysis model) from the principal component analysis basis;
- (d) calculating percentages of variance for the plurality of parameters (**Wang**, C 14 L 13-16: PCA enables reduction of a data set while retaining most of its variation) explained by each component in the estimated independent component analysis model;
- (e) if the calculated percentages of variance indicate that a component is a minor component, then transferring control to step (f), else transferring control to step (g) (**Wang**, C 14 L 14: new set of variables derived from transformations; **EN**: calculating variance to decide if a component is minor is an outcome of variable transformations);
- (f) removing the minor component (**Wang**, C 14 L 13: reduction of a data set) from the principal component analysis basis and transferring control to step (c); and
- (g) generating as output the estimated independent component analysis model wherein no component of the independent component analysis model is a minor component. (**Wang**, Abstract: detecting faults; C14 L 17: new variables are statistically uncorrelated; **EN**: To detect faults using PCA models, it is inherent that one would eliminate minor components (variables) that are statistically uncorrelated.)

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2, 3, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang as applied to claims 1 and 8 above, and further in view of Agarwal (USPN 7,006,205 B2, referred to as **Agarwal**).

As to **claims 2, 9**, Wang teaches the method of claim 1 but does not teach the calculated percentages of variance indicating that a component is insignificant if a percentage of variance for each of the plurality of parameters explained by the component is less than a minimum percentage of variance for a single parameter. However, Agarwal teaches reducing data based on variation (**Agarwal**, C 03 L 42-50: inputs can be reduced using PCA algorithm; **Fig.3**: variance as a percentage of total based upon the number of principal components). It would be obvious for one skilled in the art to combine the two references because they are both from the same field of endeavor, ie. using PCA for semiconductor applications. The teachings of Wang can be

modified to add variations as a percentage, thus optimizing the variations for the benefit of finding insignificant components.

As to **claims 3, 10**, Wang as modified by Agarwal in claim 2 teaches the method of claim 1 wherein the calculated percentages of variance (**Agarwal**, C 09 L 32: variance as a percentage) indicate that a component is insignificant (**Agarwal**, C 09 L 42: quantity of data may be significantly reduced) if an average percentage of variance for the plurality of parameters explained by the component is less than a minimum average percentage of variance.

It would be obvious for one skilled in the art to see that the PCA model for detecting faults in fabrication can be further optimized by calculating insignificant components based on percentages of variance.

7. Claims 4-7 and 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang as applied to claims 1 and 8 above, and further in view of Atsushi (USPN 6,389,366, referred to as **Heavlin**).

As to **claims 4, 11**, Wang teaches the method of claim 1 further comprising a step (h) of calculating confidence intervals (**Wang**, C02 L 63: indication of the relative conformance). Wang does not teach confidence intervals for rotation angles of the estimated independent component analysis model. However, Heavlin teaches rotation angles (**Heavlin**, C 02 L 67: Each element of the rotation matrix gives the rotation angle). It would be obvious to one with ordinary skilled in the art to combine the two

references because they both relate to technology and methods in wafer fabrication. Further, it would have been obvious to one with ordinary skills in the art to add a rotation matrix to give the rotation angles to Wang's process model because this would result in compact representation of data for improved fault detection.

As to **claims 5, 12**, Wang does not teach the method of claim 4 further comprising a step (i) of labeling a component of the estimated independent component analysis model to correspond to a specific process.

However, labeling is a primitive function and it would be obvious for one skilled in the art to label a component corresponding to a specific process in order to identify the component readily.

As to **claims 6, 13**, Wang does not teach the method of claim 5 wherein the component is labeled as one of critical dimension of gate width effect on device drive current, critical dimension of gate width effect on device threshold voltage, critical dimension of gate length effect, implant dose effect, and gate oxide thickness effect.

However, it would be obvious to one skilled in the art because labeling a component based on criteria mentioned above has the benefit of assigning significance to components corresponding to specific fabrication processes in Wang's application.

As to **claims 7, 14**, Wang does not teach the method of claim 5 further comprising a step (j) of examining the labeled component to identify a corresponding physical mechanism associated with the specific process.

However, it would be obvious to one skilled in the art to add labeling components to identify physical components to Wang's fabrication processes because this will help isolate the corresponding processes.

Examinations Considerations

8. Examiner's Notes (EN) are provided with the cited references to prior art to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and spirit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but a link to prior art that one of ordinary skill in the art would find inherently appropriate.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure –

- a. Singhal, USPN 6356861, cited for statistical models for semiconductor chips.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bharadwaj Kalpana whose telephone number is (571) 270-1641. The examiner can normally be reached on Monday-Friday 7:30am 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wu Xiao can be reached on (571) 272-7761. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KB

Mar 02, 2007


XIAO WU
SUPERVISORY PATENT EXAMINER